Your inquiry of July 12 and the enclosures which you sent make most interesting reading. It may be that our pressure inking system may have application to your equipment.

Enclosed with this letter you will find a copy of U. S. Patent Reissue No. 25,692 under which we manufacture the inking system which we use on our recording equipment. To inform you further I am also enclosing some literature describing our products which use pressure ink marking.

I have the feeling that it will not be possible for you to decide as to the applicability of our pressure ink marking system to your equipment without actually seeing it at firsthand. For this reason, by copy of this letter, I am requesting Mr. STAT [ ] our general sales manager, to arrange to have one of our sales engineers contact you for the purpose of arranging for a demonstration. We have an office in [ ] STAT STAT [ ] where you may see our recording equipment in action. According to your wishes, you may do that or have one of our men demonstrate a portable unit to you in your [ ] STAT office.

When you have ascertained the degree of your further interest, I will look forward to hearing from you again. In the meantime, please be assured of our earnest wish to cooperate with you.

[ ] STAT

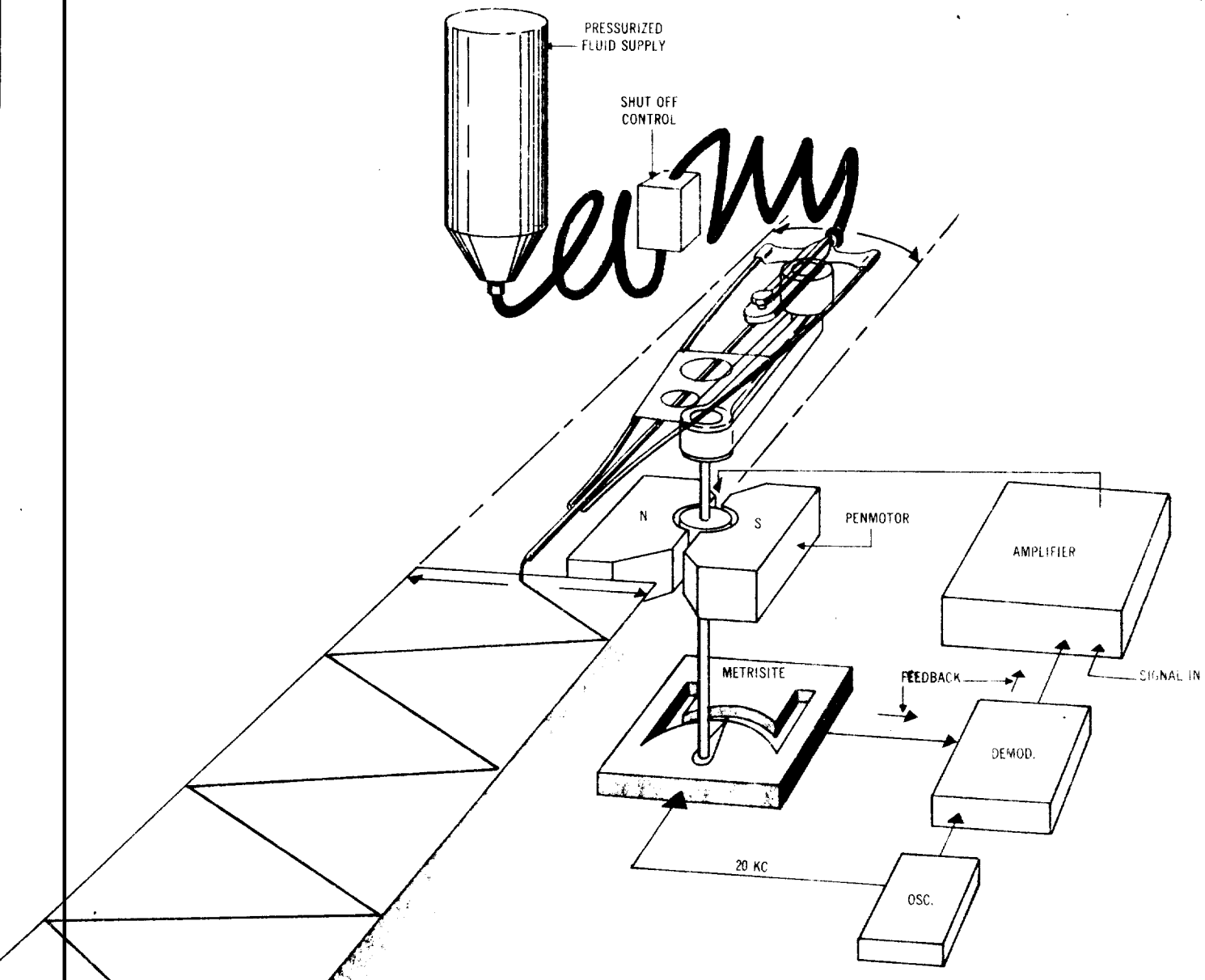


MSH:ib

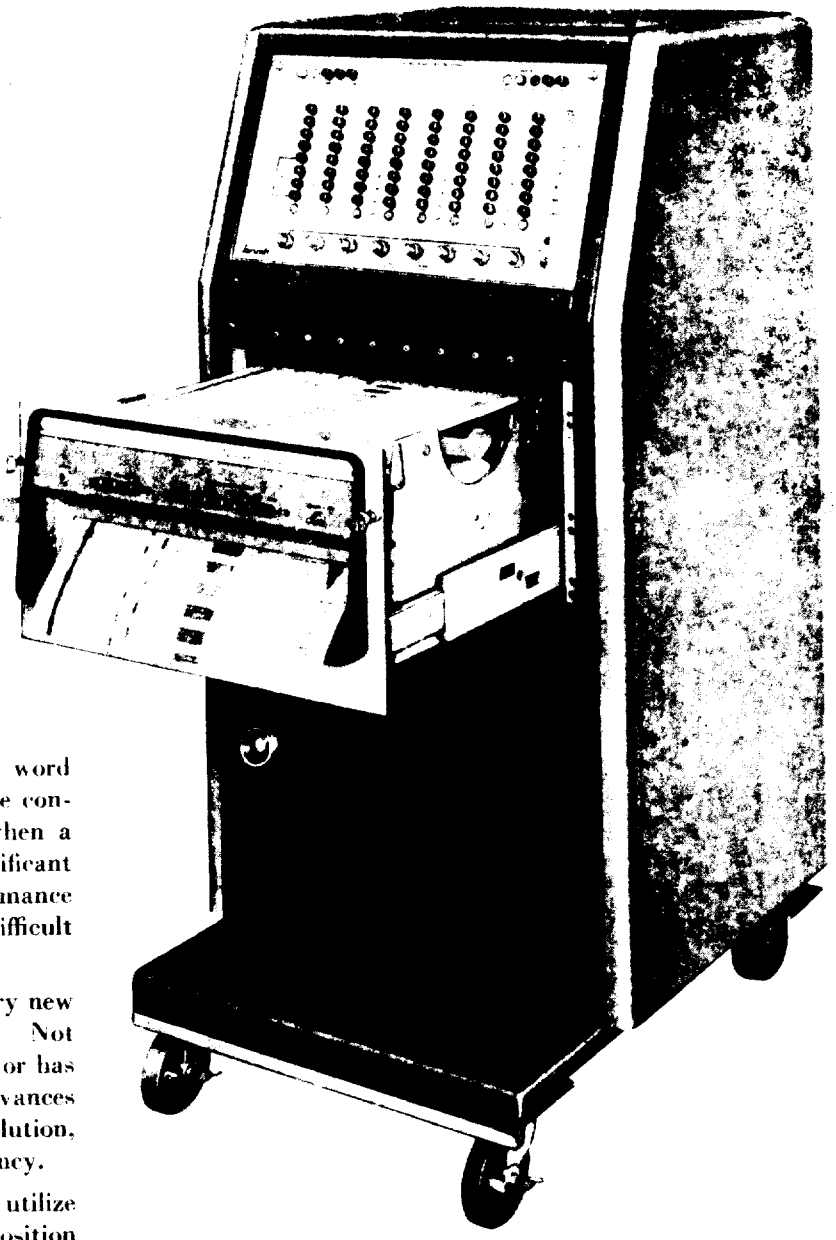
brush

# RECORDER MARK 200

*Forced-fluid writing, true rectilinear pen motion and pen-position feedback provide records of unparalleled accuracy and clarity. This article details how these innovations contribute to the direct writing medium.*



# RECORDER MARK 200



## A Totally NEW Recorder

IN the fast-growing electronics industry, the word "breakthrough" is widely used and abused. The conscientious reporter hesitates to use it. Yet, when a new product incorporates not one, but four significant technical advances and exhibits a level of performance never before achieved, the hackneyed word is difficult to avoid.

The Brush Recorder Mark 200, a revolutionary new direct writing system, is a true breakthrough. Not since the introduction of the d'Arsonval penmotor has the direct writing recorder seen comparable advances in all five major parameters -- accuracy, resolution, clarity of records, operating economy and efficiency.

First, *accuracy*. Newly conceived penmotors utilize the proprietary Brush Metrisite transducer for position feedback control and eliminate the mechanical restraint of the conventional torsion rod for zero return. The penmotor coil, supported only by precision ball bearings, rotates freely in a constant magnetic field. The pen position is continuously sensed by the Metrisite and compared against the input signal command. If the pen position is incorrect, the difference between the Metrisite output and the input command produces an "error" signal which is amplified and applied to the penmotor until the correct position is reached. Accuracy of the pendrive system approaches ¼ percent.

Taking all other error-factors into account -amplifiers, pen linkage, chart drive and residual system errors—the Mark 200 exhibits a remarkable over-all system accuracy of one-half of one percent. This applies to high-speed pen motion as well as to low-frequency or static recording.

Second, *resolution*. Traces produced by the Mark 200 have a fixed, uninterrupted width of approximately .010"—about 1/5 chart division—up to highest writing speeds. These thin, sharp traces enable the engineer to read and interpret high speed transients or very slight pen movements with great exactitude. A fully closed, pressurized ink delivery system writing on a high-gloss paper makes possible an exceptionally fine trace which cannot be smeared, is proof against clogging or spattering.

*Record Clarity* depends on cleanness and contrast of

the written record. Many engineers find it easier to coordinate multi-channel rectilinear, rather than curvilinear, traces with the graphs and charts with which they normally work. In most oscillographic recorders this is achieved by means of a heated stylus writing on heat sensitive paper pulled over a knife-edge, with some loss in linearity. A unique pen-linkage in the Mark 200 system completely cancels such errors, and produces true rectilinear motion at the pen tip. Records appear in solid blue on pure white paper, for utmost visibility and contrast. Reproducibility by common methods is good.

*Operating economy and efficiency.* The Recorder Mark 200 uses ink-writing paper costing less than one-third that of comparable heat writing or electric writing paper. Thus the economy of ink-type papers is combined with two important advantages—rectilinear presentation and long term unattended operation. Operation versus downtime ratio is extremely high: chart paper is used in 500-foot rolls and a single ink cartridge provides for an average six months of daily use. The inking system will not clog, is always ready for operation even after several months' shutdown. Pushbutton controls for all recorder functions including calibration further simplify operating and recording procedures.

The Mark 200 is an integrated system, including amplifiers, signal conditioning equipment and recorder in a mobile console configuration, ideal for analog computer readout, telemetry, test-stand or laboratory applications.

## . . . A Totally NEW Penmanship

The section of recorder chart below is reproduced as faithfully as possible from an actual chart made to tax the Mark 200 writing capacity to the utmost. Noteworthy are the uniformity of the trace, especially at wide pen excursion; the rule-straight error-free traverse; the absence of "slowdown" or "overshoot" as the pens suddenly change direction.

Primarily responsible for these near-perfect traces is a writing system as simple in concept as it is unique. For the first time a practical pressurized fluid inking system has been achieved in a direct writing recorder.

To evaluate the achievement, imagine what happens when fluid under significant positive pressure is forced through a pen aperture measuring .010" in diameter. In effect, the answer was a miniature closed hydraulic system with external delivery controlled by pen movement.

Figure 1 shows the fluid source, an aerosol cartridge

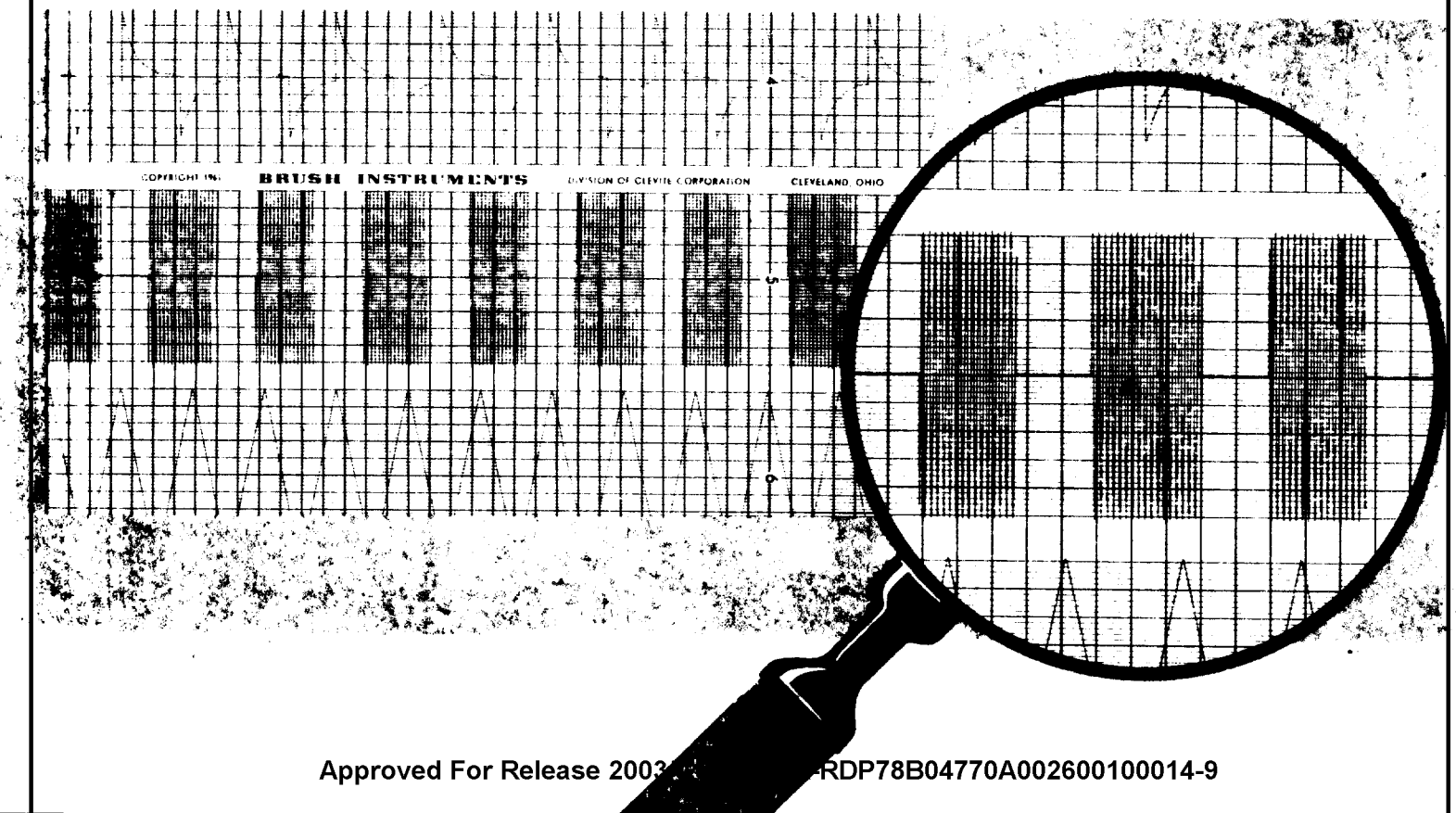


Fig. 1— Pressurized cartridge containing writing fluid mounts in rear of oscillograph. Single supply feeds all pens.

holding a supply of viscous writing fluid under pressure, mounted in the oscillograph chassis.

From here the fluid passes forward to a manifold, thence to the recorder's eight analog pens and two event-marker pens which deposit the fluid directly on the chart paper, as shown in Figure 2.

To assure controlled delivery and to prevent spurting at the writing point, a balance of forces is at work. Pen pressures many times higher than normal for conventional systems are required to contain the fluid laid down on the chart.

The higher pen pressures impose three further considerations. One is design of the pen itself. Structure is extremely rigid and reinforced against possible twisting at rapid traverse. The second is the requirement for more powerful penmotors and amplifiers to overcome increased inertia. A third is greatly increased penmotor stiffness, to offset frictional factors, obtainable only through a position feedback system.

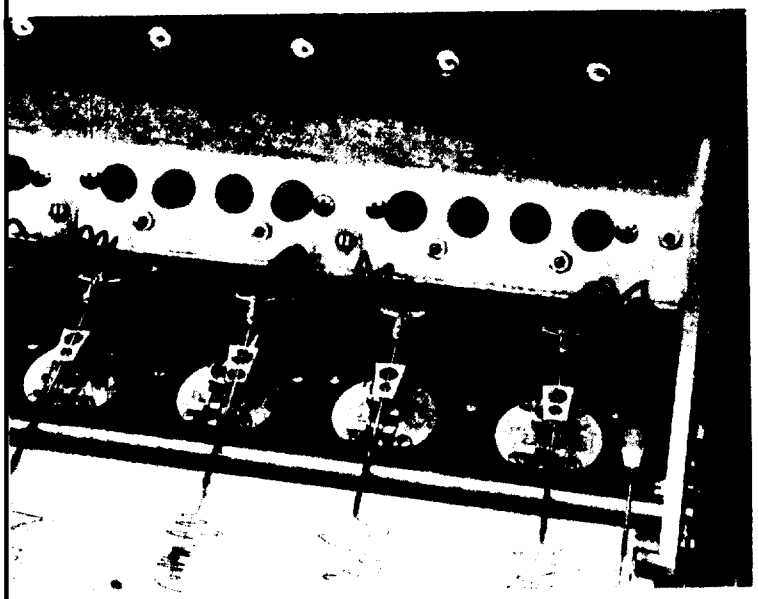


Fig. 2— Four of the Mark 200's eight analog pens. Event-marker pen at right. All draw fluid from single manifold.

Thus, the writing system is inseparable from the electro-mechanical pendrive mechanism. The entire recording system is in fact an integrated electro-mechanical-hydraulic system which is inherently simple and rugged. Advantages, aside from visual clarity and high resolution, include exceptional accuracy in both static and dynamic recording; long-term unattended operation; low-cost chart paper; minimum downtime for ink replenishment; greater chart capacity. Added to this is the most important of all recording system requirements, reliability.







Printed in U. S. A.

9 AUG 1965

T [redacted]

Advise me of what action we're taking or planning. See

T [redacted] - need to prepare answering memo as do our intelligence.

Approved For Release 2003/01/28 : CIA-RDP78B04770A002600100014-9

George - Talked [redacted] STAT - They are in contact STAT
with a man from [redacted]
re the pen problem - & are sending me this name &
material they have on a new pen & ink system -
for their high speed mechanical recorder.
The ink is high viscosity (ball point type) under
pressure. They don't [redacted] STAT know what
it will do in a dotting mode on the plotter -
See what [redacted] STAT in Graphics might
suggest & prepare memo for [redacted] STAT
that we are aware of the problem & are
looking into it.

MEMORANDUM FOR: Record

Clearprint # 1020 & 1025
tracing paper

Stability

"to stable as to atmospheric changes, contraction and expansion does not exceed 1/8" in 42" width in either direction in a 36 hour period."

(DATE)

FORM NO. 1 AUG 54 101 REPLACES FORM 10-101 WHICH MAY BE USED. (47)

STAT

MEMORANDUM FOR:

Info on stability of scribe coat & paper for humidity & temp changes

(48"×52" paper)

±.05% full scale or ±0.015"

(DATE)

FORM NO. 101 REPLACES FORM 10-101
1 AUG 54 WHICH MAY BE USED. (47)

40° – 90° temp

50% – 75% humidity

paper

tracing vellum

1000 ft clear print

[redacted]

Fed Spec

MEMORANDUM FOR:

15% change in humidity
from 65 to 50%.
.075% in machine dir
.25% in cross dir

Test method # 102
Fed Spec UU-P-31
GSA

(DATE)

FORM NO. 101 REPLACES FORM 10-101
1 AUG 54 WHICH MAY BE USED.

(47)

John:

Dimensional Stability of Papers:
"Photography", by C.B. Neblette.
6th Edition, page 178-179.
"... and paper dimensions can be expected to change as much as 0.3% for each 10% rise or fall in rel. humidity".

Photo Paper

Dimensional Stability
"Kodak Photographic Papers", Data Book G-1.
Page 22, 7th edition, 1960. (Marston's)
Gives same percentages as above.

Dept. of Defense & Federal Spec. Indexes list all types of paper, but no specs contain the words "Dimensional stability" or "Dimensional" in the title

9-8-65 Vic R.